

# AMENDMENTS TO THE SPECIFICATION

1.) Please replace paragraph 5 in the specification as filed with the paragraph below:

**[0005]** Raman fiber lasers can be used, for example, as energy sources. In general, Raman fiber lasers include a pump source coupled to a fiber, such as an optical fiber, having a gain medium with an active material. Energy emitted ~~from~~ from the pump source at a certain wavelength  $\lambda_p$ , commonly referred to as the pump energy, is coupled into the fiber. As the pump energy interacts with the active material in the gain medium of the fiber, one or more Raman Stokes transitions can occur within the fiber, resulting in the formation of energy within the fiber at wavelengths corresponding to the Raman Stokes shifts that occur (e.g.,  $\lambda_{s1}$ ,  $\lambda_{s2}$ ,  $\lambda_{s3}$ ,  $\lambda_{s4}$ , etc.).

2.) Please replace paragraph 27 in the specification as filed with the paragraph below:

**[0027]** In some embodiments, the invention can provide a Raman fiber laser ~~than that~~ can convert energy entering the Raman fiber laser at a particular wavelength (e.g., a pump wavelength) to energy exiting the Raman fiber laser at a different wavelength (e.g., a desired wavelength) with relatively high efficiency (e.g., an efficiency of: at least about 35%, at least about 40%, at least about 45%, at least about 50%, at least about 55%, at least about 60%, at least about 65%, at least about 70%, at least about 75%, at least about 80%, at least about 85%, at least about 90%, at least about 95%, at least about 98%).

3.) Please replace paragraph 58 in the specification as filed with the paragraph below:

**[0058]** Without wishing to be bound by theory, it is believed that these characteristics of fiber **110** can be explained using the following system of nonlinear differential equations.

$$\begin{aligned}\frac{dI_p^+}{dz} &= -g_p(I_{\lambda_{s1}}^+ + I_{\lambda_{s1}}^-) \times I_p^+ - \alpha_p I_p^+ = -\frac{dI_p^-}{dz} \\ \frac{dI_{\lambda_{s1}}^+}{dz} &= [-g_1 I_{\lambda_{s1}}^+ \times (I_p^+ + I_p^-) - \alpha_1 I_{\lambda_{s1}}^+ - g_1' I_{\lambda_{s1}}^+ \times (I_{\lambda_{s1}}^+ + I_{\lambda_{s1}}^-)] = -\frac{dI_{\lambda_{s1}}^-}{dz} \\ \frac{dI_{\lambda_{s1'}}^+}{dz} &= g_1' I_{\lambda_{s1'}}^+ \times (I_{\lambda_{s1}}^+ + I_{\lambda_{s1}}^-) - \alpha_1' I_{\lambda_{s1'}}^+ = -\frac{dI_{\lambda_{s1'}}^-}{dz}\end{aligned}$$

4.) Please replace paragraph 76 in the specification as filed with the paragraph below:

[0076] With this arrangement, as energy at  $\lambda_p$  enters optical fiber **810**, the energy propagates through section **130** and creates energy at wavelength  $\lambda_{s1}$ . Energy at  $\lambda_{s1}$  then propagates through sections **130** and **140** in the forward direction until it reaches reflector **170** where it is reflected backward through sections **140** and **130**. Energy at  $\lambda_{s1}$  then propagates through sections **140** and **130** in the reverse direction until it reaches reflector **160** where it is reflected forward through sections **130** and **140**. Energy at  $\lambda_{s1}$  continues to propagate in fiber **810** in the forward and reverse directions between reflectors **160** and **170**.

5.) Please replace paragraph 78 in the specification as filed with the paragraph below:

[0078] As energy at  $\lambda_{s1}$  propagates through section **820** of fiber **610, 810**, it creates energy at wavelength  $\lambda_{s1'}$ . Energy at wavelength  $\lambda_{s1'}$  propagating in section **820** in the reverse direction is reflected by reflector **830** and then propagates through section **820** in the forward direction. Energy at wavelength  $\lambda_{s1'}$  propagating through section **820** in the forward direction impinges on reflector **840**. Some of the energy at wavelength  $\lambda_{s1'}$  impinging on reflector **840** is reflected by reflector **840** and then propagates through section **820** in the reverse direction, and some of the energy at wavelength  $\lambda_{s1'}$  impinging on reflector **840** passes through reflector **840** and exits fiber **810**.

6.) Please replace paragraph 80 in the specification as filed with the paragraph below:

[0080] Fig. 13 shows an embodiment of a Raman fiber laser system **1300** that includes a suppressor **1310** in section **820** of optical fiber **410, 810**. Suppressor **1310** is designed to suppress the formation of energy at higher order Raman Stokes shifts (e.g., one or more of  $\lambda_{s2'}$ ,  $\lambda_{s3'}$ ,  $\lambda_{s4'}$ , etc.). Suppressor **1310** can be, for example, an LPG having its resonance frequency at  $(c/\lambda_{s2'})$ , where  $\lambda_{s2',-1} = \lambda_{s1',-1} - \lambda_p,-1$ . The presence of suppressor **1310** in section **820** may be desirable, for example, when the power of wave  $\lambda_{s1'}$  in section **820** is sufficiently high that the power of wave  $\lambda_{s2'}$  (and/or energy at higher order Raman Stokes shifts for the active material in the gain medium of section **820** of fiber **810**) that would form in section **820** in the absence of suppressor **1310** would substantially interfere with the desired performance of the system. System **1300** can optionally include reflector **310**, suppressor **410** and/or suppressor **1110**.

7.) Please replace paragraph 85 in the specification as filed with the paragraph below:

**[0085]** Furthermore, while Raman fiber lasers and Raman fiber laser systems have been described in which sections of the optical fiber are spliced together, the invention is not limited in this sense. Generally, the sections of fiber are coupled together so that energy can propagate therebetween. Typically, the sections of fiber are contiguous. For example, in some embodiments, two neighboring sections of the optical fiber can have an interferometric connection. In certain embodiments, two neighboring sections of the optical fiber can be connected by a lens (e.g., a ~~Green~~GRIN lens).